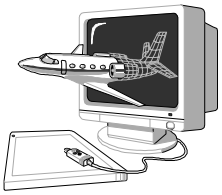
FAA National Software Conference, May 2002
Object Oriented Activities & Status

Object Oriented Technology
FAA's Vision and Status



Barbara Lingberg
May 14, 2002

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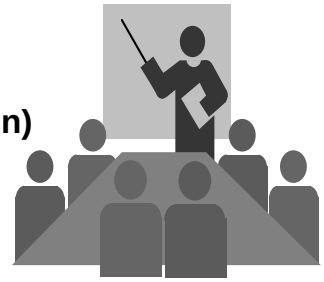
Briefing Outline

- **Background**
- **FAA Vision**
- **Current Activities (2002)**
  - Workshops
  - Milestones
  - Schedule
- **Future Plans (2003 and on)**
  - Milestones
  - Schedule
- **Summary**



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FAA National Software Conference, May 2002
Object Oriented Activities & Status

Background

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OOT Background

- **Multiple projects are struggling with Object Oriented Technology (OOT)**
- **OOT is a concern for both government and industry**
- **FAA-sponsored research in OOT started in 2000**
  - Focusing on structural coverage issues
  - Through NASA Langley and Boeing
- **Industry-sponsored research in OOT started in 2000**
  - Aerospace Vehicle Systems Institute (AVSI)
- **Both industry and FAA efforts revealed need for specific guidance when using OOT in aviation products**

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CAST C++ Position

- **Certification Authorities Software Team (CAST) Paper (P-65) -** ***Use of the C++ Programming Language***
- **Started in mid-2001**
- **Completed in January, 2002**
- **Documents Potential Compile-Time Issues**
  - Dead/Deactiviated Code
  - Encapsulation
  - Inheritance
  - Overloading
- **Documents Potential Run-Time Issues**
  - Dynamic Binding/Dispatch
  - Polymorphism
- **Serves as Basis for Issue Paper on Several Projects**
- **Copy in Presentation Package**

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FAA Vision

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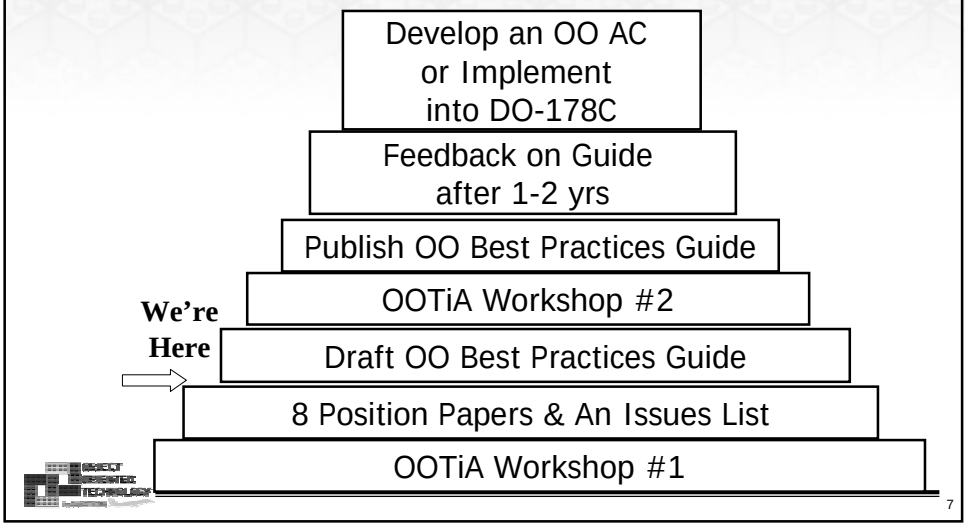
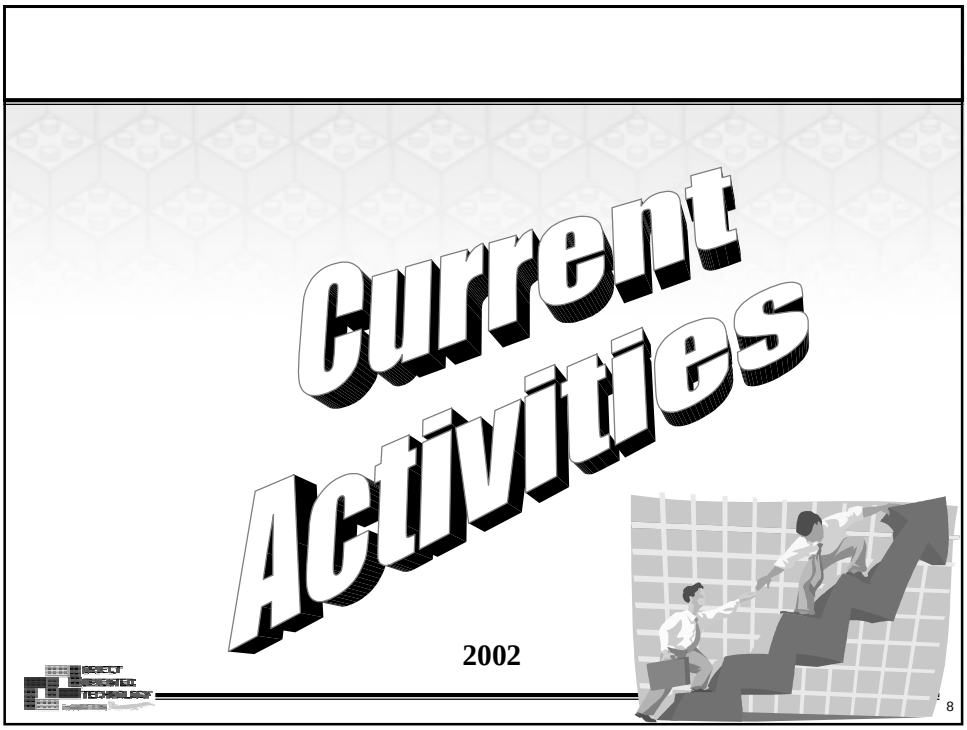
FAA National Software Conference, May 2002
Object Oriented Activities & Status

FAA's Vision for OOT in Aviation (OOTiA)





OOTiA Workshop #1

- In August 2001, established need for a workshop
- Gathered issues from industry via web-site and e-mail
- Prioritized the issues
- Formed OOTiA workshop committee in November 2001 (including government & industry members)
- Split into 3 teams to develop draft positions on the issues

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OOTiA Workshop #1 (cont)

- OOTiA Workshop #1 held April 9-11, 2002
- Workshop Sponsored by NASA Langley
- Workshop Purpose:
  - Identify safety and certification issues related to using OOT
  - Begin coordination and communication between industry, government, and academia on the OOT topic
  - Work together to establish positions on key issues
- Focus: Best practices for OO implementation

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OOTiA Workshop #1 (cont)

- **8 Papers and Glossary**
  - OOTiA-1 Single Inheritance & Dynamic Dispatch
  - OOTiA-2 Multiple Inheritance
  - OOTiA-3 Reuse & Dead/ Deactivated Code
  - OOTiA-4 Tools
  - OOTiA-5 Templates
  - OOTiA-6 Inlining
  - OOTiA-7 Type Conversion
  - OOTiA-8 Operator Overloading
  - Glossary Includes DO-178B terms & OOT terms

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OOTiA Workshop #1 (cont)

Results:

- **114 Participants from Government, Industry, and Academia**
- **Revised papers and expanded issues list**
- **Established milestones and schedule for near-term**
- **Proposed Draft Best Practices Guide Outline**

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Expanded Comments/Issues

- Agree on terminology and issues
- Ensure consistency within / across papers
- Identify pitfalls of using OOT
- Be open to experience
- Add examples (both good and bad)
- Consider re-definition of some terms, source-to-object traceability beyond Level A
- Map issues with rules, patterns, and DO-178B
- Add rationale behind each rule
- Create language-specific appendices

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Near-Term Milestones & Timeline

- Accept comments from Workshop participants (May 02)
- Update papers based on comments (Jun 02)
- Consolidate papers into Draft Guide (Jul - Aug 02)
- Draft OOT Best Practices Guide (Sep 02)
- OOTiA Workshop #2 –
  - Tentatively Scheduled:
    Nov. 5 -7, 2002
    Hampton Roads Area, VA
  - Use Draft Best Practices Guide as input

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OO Best Practices Guide (Draft Outline)

- Table of Contents
- Executive Summary
- Ch 1: Introduction (Scope, How To Use the Guide, Background, …)
- Ch 2: Best Practices on Single Inheritance & Dynamic Dispatch
- Ch 3: Best Practices on Multiple Inheritance
- Ch 4: Best Practices on Templates
- Ch 5: Best Practices on Inlining
- Ch 6: Best Practices on Type Conversion
- Ch 7: Best Practices on Overloading
- Ch 8: Best Practices on Traceability
- Ch 9: Best Practices on Addressing Dead Code and Reuse
- Ch 10: Best Practices on OO Tools
- Appendices (Examples, Language Issues, Glossary, Index, …)

Note: The outline is still evolving!

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OOTiA Contacts

OOTiA Web Site:

http://shemesh.larc.nasa.gov/foot

FAA POC:

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Future plans

2003 and Beyond

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Future Milestones & Timeline

- Modify OOT Best Practices Guide (Feb 03)
- Send Guide Out for Comments (Apr 03)
- Implement Comments (Jul 03)
- Publish Guide (Sep 03)
- Deliver Training on the Guide (Oct 03)
- Receive Feedback on Guide's Usage (~Sep 03 to Sep 04)
- Determine approach - AC vs. DO-178C (~end of 04)

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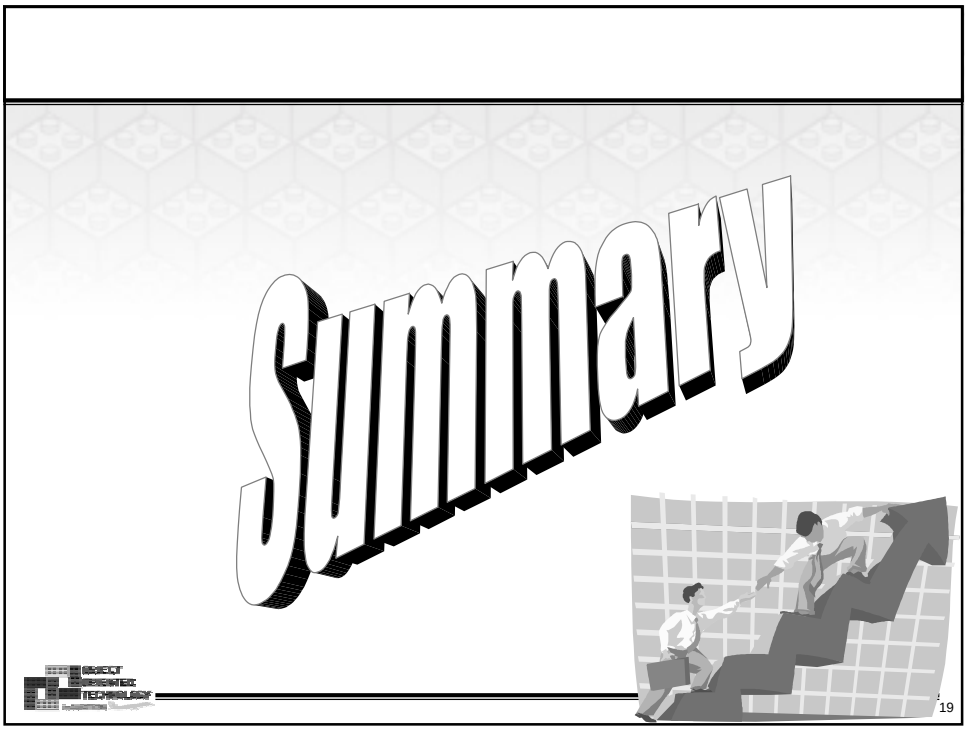

Summary

- We recognize need for OOT guidance
- We are working toward both near- and long-term solutions
- We have made great strides but have long way to go
- We're striving to safely address and enable use of OOT in aviation software

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